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Enumeration and Biological Data on Arctic Grayling, *Thymallus arcticus*, Kakisa River, N.W.T., 1984

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Central and Arctic Region
Department of Fisheries and Oceans
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ABSTRACT

Read, C.J. and M.M. Roberge. 1989. Enumeration and biological data on Arctic grayling, Thymallus arcticus, Kakisa River, N.W.T., 1984. Can. Data Rep. Fish. Aquat. Sci. 750: iv + 15 p.

A fish weir was constructed across the Kakisa River in 1984 to enumerate the spring spawning run of Arctic grayling. All Arctic grayling passing through both the upstream and downstream traps were counted, tagged, and/or sampled. The biological data on grayling presented includes length, weight, age, and sex. All other species, from both traps, were counted, tagged and/or sampled.

Key words: weirs; sport fishing; tagging.

RÉSUMÉ

Read, C.J. and M.M. Roberge. 1989. Enumeration and biological data on Arctic grayling, Thymallus arcticus, Kakisa River, N.W.T., 1984. Can. Data Rep. Fish. Aquat. Sci. 750: iv + 15 p.

Un barrage a été construite en travers de la rivière Kakisa en 1984 pour dénombrer la montaison de printemps de l'ombre arctique. Tous les ombres arctiques traversant les pièges amont et aval ont été dénombrés, marqués et/ou prélevés. Les données biologiques sur l'ombre arctique comprennent la longueur, la masse, l'âge et le sexe. Tous les spécimens appartenant à d'autres espèces capturés dans l'un ou l'autre des pièges ont été dénombrés, marqués et/ou prélevés.

Mots-clés: barrages; pêche sportive; étiquetage.

INTRODUCTION

Arctic grayling, Thymallus arcticus (Pallas), occurs throughout most of the freshwater drainages of the mainland Northwest Territories (NWT) (Scott and Crossman 1973). It is considered to be the second most important sport fish species in the NWT (Topolniski, unpublished data). A major spring spawning run of grayling occurs in the Kakisa River (Fig. 1). It provides an opportunity for angling by the residents of the southern Great Slave Lake area and northern Alberta (Moshenko and Low 1983). The Mackenzie Highway, which crosses the river, provides easy access to this Arctic grayling spawning concentration.

In 1971, an ongoing monitoring program of the Kakisa River sport fishery was initiated by the Department of Fisheries and Oceans (DFO) to obtain data necessary for the management of the grayling fishery. Information collected included length, weight, and age of grayling angled and retained as well as catch and effort data of the fishery (Falk and Dahlke 1975; Falk et al. 1980; Dahlke 1983; Moshenko and Low 1983). Recommendations from these studies resulted in the reduction of catch and possession limits (C/P) and implementation of size restrictions (5 and 10 C/P and minimum size of 356 mm in 1974; and 5 C/P in 1979). In 1983, DFO again conducted a monitoring program on the sport fishery. Results from this study indicated a significant increase from the 1970's in the number of anglers and in the number of grayling caught and retained (Low, unpublished data). Therefore, in 1984, due to the concern that the grayling spawning population was being over-exploited, DFO conducted an enumeration and assessment study. In conjunction with this study, a monitoring program was also conducted and results of this and the 1983 program were presented in Low and Read (1987).

This report presents, in tabular form, the results of the enumeration and assessment program which includes information on the minimum size of the Arctic grayling spawning population in 1984 and corresponding length, weight, and age data.

MATERIALS AND METHODS

FISH WEIR

A fish weir with two traps was put across the Kakisa River, between the Mackenzie River bridge and Beaver Lake (Fig. 2), to enumerate the Arctic grayling that utilize the Kakisa River for spawning. One trap was set to facilitate the enumeration and sampling of the upstream run of grayling while the other trap was set to facilitate the same for the subsequent downstream run.

The weir was constructed of 1.52 m upright lengths of 1.27 cm thin-walled galvanized conduit supported by 3.05 m lengths of channel iron with 2 cm holes drilled 3.4 cm apart (centre to centre) to support the conduit (Fig. 3). The channel iron was supported by brackets on tripods consisting of 2.13 m iron pipe and 'A' frames made of two lengths of 5.08 x 10.16 cm (2 x 4) with a supporting cross member. The tripods were weighted down with burlap bags of rocks hung over the cross member of the 'A' frame. The weir was built in an 'N' formation to accommodate an upstream trap at one apex and a downstream trap at the other apex (Fig. 4). A detailed description of the type of weir used is presented in Kristofferson et al. (1986).

Each trap was a 1.22 m by 2.44 m box frame made of 2 x 4s with holes in which the 1.52 m lengths of conduit fit to enclose the trap. The front of the trap consisted of a 'V' shaped throat to funnel the fish through the 18 cm opening into the trap. The back door could be opened to allow fish through or closed to facilitate sampling and tagging of the fish. The top of each trap was partially covered with plywood to provide a seat for the person recording the data.

Construction of the fish weir commenced on April 26, 1984 and was completed on April 27 with the first trap check made at 09:30 h on April 28. Each trap was checked several times daily on a semi-regular basis depending on the strength of the fish run. All species of fish entering the trap were identified and enumerated. Arctic grayling were either enumerated and released, tagged and released, live sampled and released or sacrificed for biological sampling (dead sample).

The last downstream trap check was May 30 after 9.14 m of the weir had washed out. The last upstream trap check was June 1 after which the weir and traps were removed from the water.

TAGGING

Approximately 7% of the Arctic grayling enumerated were tagged. Fish were placed in a measuring trough attached to a hanging scale. A nose strap secured the fish while a tag was being inserted. Floy (spaghetti) tags marked with a reference number and return address were attached using a Dennison tagging gun. Tags were inserted in the left side of the fish at the base of the dorsal fin and anchored between the pterygiophores. The tag number, fork length (+/- 1 mm), weight (+/- 50 g), and sex (if determinable) were recorded for each fish. Sex was determined externally by the expulsion of eggs or milt under slight pressure or by the larger dorsal fin of the male grayling (Rawson 1950). Scale samples were taken for age determination and stored in coin envelopes marked with the sample information. Age determination was carried out in the laboratory with the use of microprojector to enlarge the scale image to facilitate interpretation of the annual rings.

ENUMERATION AND BIOLOGICAL SAMPLING

Although the weir was constructed as soon as water conditions permitted it was suspected that the upstream run of Arctic grayling had already begun under the ice. This suspicion seemed to be confirmed when the number of grayling

enumerated through the downstream trap outnumbered more than 2:1 the number of grayling enumerated through the upstream trap. Therefore upstream count is not a complete enumeration but is is believed that the majority of the downstream run was enumerated.

A live sample of each species passing through both upstream and downstream traps was taken each day of operation. Fork length, weight, scales (age), and sex (if determinable) was obtained from each live sample. The number of fish sacrificed was kept to a minimum because of a concern for the current level of exploitation. Less than 1% of the Arctic grayling were dead sampled. Fork length (+/- 1 mm), round weight (+/- 50 g), sex, and scales (age) were taken from the dead samples.

DATA ANALYSIS

Condition factor (K), a measure of the plumpness of the fish, was calculated using the following equation:

$$K = \frac{W \times 10^5}{L^3}$$

where:

W = weight in grams
L = length in millimetres

Biological data were analyzed using the Micro Vax II computer. The Statistical Analysis System (1985) was used to generate length, weight, age, and enumeration tables.

ACKNOWLEDGMENTS

Special thanks to D. McGowan, B. Dunn, B. Howard, and P. Unger for constructing and operating the fish weir. Appreciation is extended to the staff of Department of Fisheries and Oceans in Hay River, especially G. Low, for logistical support. The authors also thank A.H. Kristofferson for permission to use figures from Kristofferson et al. (1986). Figures were prepared by Graphic Services and typing was done by K. DeCaigny. G. Low reviewed the manuscript.

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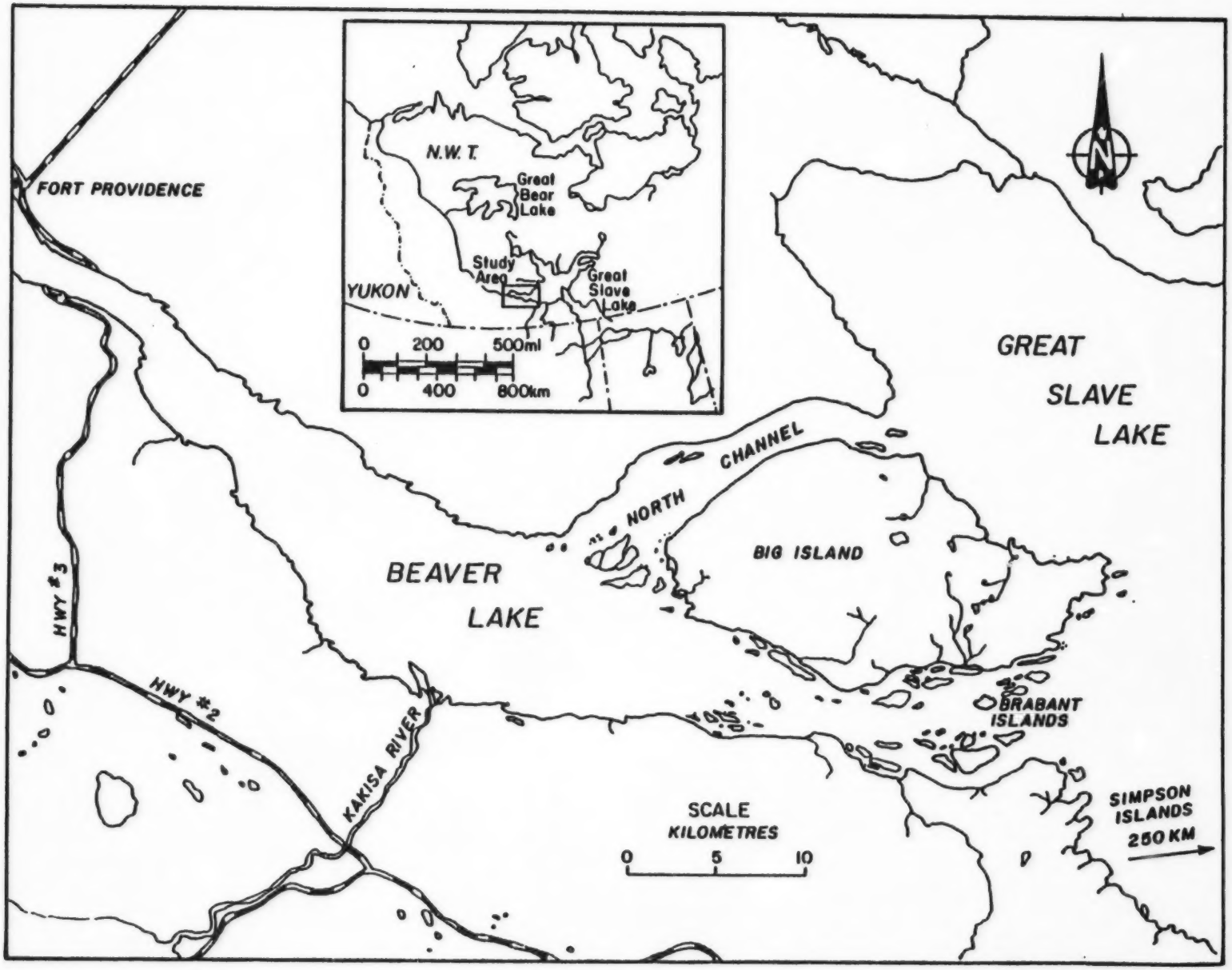

Fig. 1. Map of the Northwest Territories showing the location of the study area.

Fig. 2. Map of the Kakisa River showing the location of the fish weir, 1984.

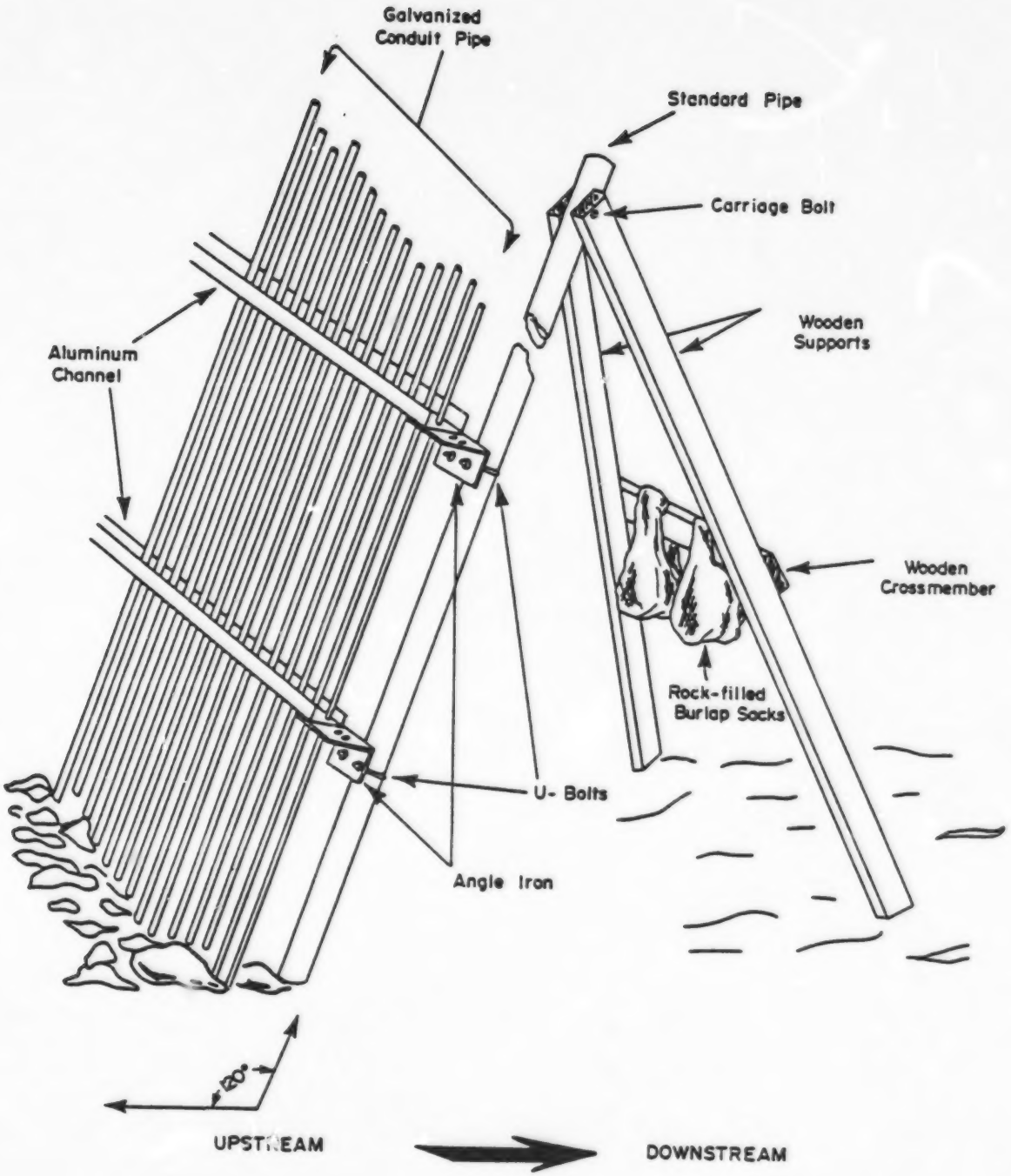

Fig. 3. Diagram showing the weir construction by section.

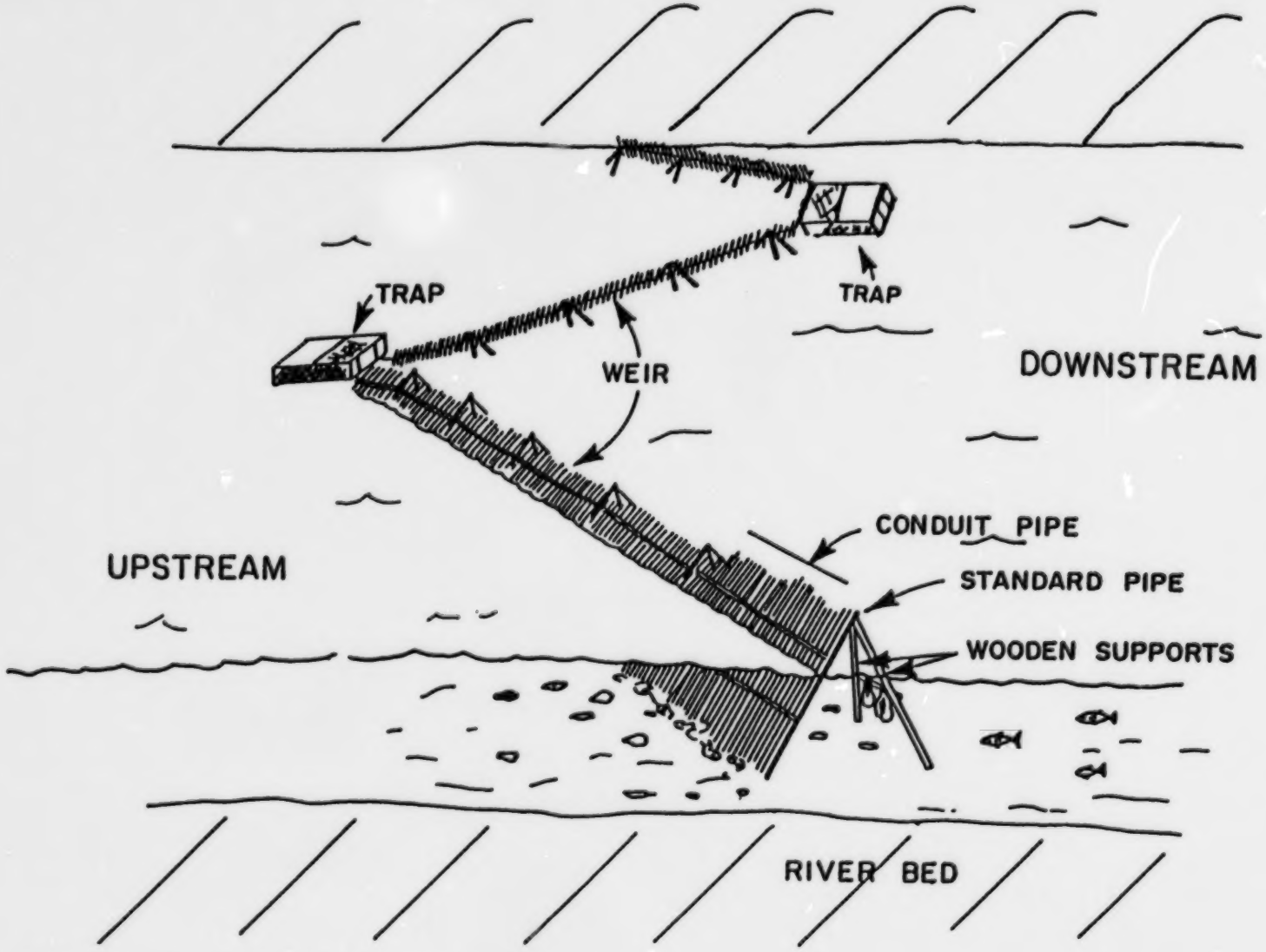

Fig. 4. Diagram showing the configuration of the weir and traps on the Kakisa River, 1984.

Table 1. Biological data by length interval for Arctic grayling sampled from the upstream trap, Kakisa River, 1984.

LENGTH INTERVAL (MM)	MALES N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	FEMALES N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	COMBINED N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	% FEMALE
180	-	-	-	-	-	-	-	-	-	-	-	-	2	1	198	100	0	1.29	-
200	-	-	-	-	-	-	-	-	-	-	-	-	3	1	212	133	29	1.38	-
220	-	-	-	-	-	-	-	-	-	-	-	-	5	1	233	180	45	1.41	-
240	-	-	-	-	-	-	-	-	-	-	-	-	1	0	249	200	-	1.30	-
260	-	-	-	-	-	-	-	-	-	-	-	-	4	1	270	288	111	1.44	-
280	-	-	-	-	-	-	-	-	-	-	-	-	20	6	286	360	77	1.53	-
300	-	-	-	-	-	-	-	-	-	-	-	-	10	3	310	425	54	1.44	-
320	-	-	-	-	-	-	-	-	-	-	-	-	5	1	330	570	144	1.59	-
340	5	6	352	640	74	1.47	8	6	353	688	83	1.56	26	7	350	675	218	1.57	62
360	12	14	371	721	101	1.40	27	22	373	780	135	1.50	61	17	371	737	117	1.44	69
380	16	18	387	794	57	1.37	41	33	390	891	88	1.51	79	22	389	861	106	1.46	72
400	36	41	409	932	71	1.36	33	26	410	994	119	1.44	85	24	409	956	107	1.40	48
420	12	14	428	1025	112	1.31	11	9	426	1164	129	1.50	36	10	428	1086	136	1.39	48
440	4	5	452	1188	144	1.29	5	4	448	1140	156	1.27	18	5	449	1225	176	1.35	56
460	3	3	461	1207	150	1.23	-	-	-	-	-	-	3	1	461	1207	150	1.23	-
480	-	-	-	-	-	-	-	-	-	-	-	-	1	0	491	1300	-	1.10	-
TOTAL	88						125						359						
MEAN			403	895	164	1.36			394	915	171	1.48			381	822	271	1.44	59

Table 2. Biological data by age group for Arctic grayling sampled from the upstream trap, Kakisa River, 1984.

AGE (YR)	MALES N	%	LENGTH(MM) MEAN	SD	WEIGHT(G) MEAN	SD	K	FEMALES N	%	LENGTH(MM) MEAN	SD	WEIGHT(G) MEAN	SD	K	COMBINED N	%	LENGTH(MM) MEAN	SD	WEIGHT(G) MEAN	SD	K	% FEMALE
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	3	224	17	161	49	1.40	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31	10	290	14	368	87	1.49	-
4	6	8	371	10	692	66	1.35	7	6	359	13	736	75	1.59	31	10	355	19	653	107	1.45	54
5	8	11	388	18	813	136	1.38	10	9	383	17	835	147	1.48	27	8	380	18	787	145	1.42	56
6	42	55	399	20	887	125	1.39	55	50	390	17	893	148	1.50	132	41	392	20	884	160	1.47	57
7	16	21	419	22	988	186	1.33	31	28	408	22	1021	171	1.49	72	22	412	24	997	207	1.41	66
8	3	4	433	28	1057	144	1.30	7	6	423	26	1050	163	1.38	13	4	427	23	1071	158	1.37	70
9	1	1	460	-	1050	-	1.08	1	1	392	-	850	-	1.41	6	2	441	39	1133	204	1.33	50
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	452	-	1250	-	1.35	-
TOTAL	76							111							322							
MEAN			402	25	894	159	1.37			395	23	923	171	1.49			380	49	822	271	1.44	59
MEAN AGE	6.2							6.2							5.7							

Table 3. Biological data by length interval for Arctic grayling sampled from the downstream trap, Kakisa River, 1984.

LENGTH INTERVAL (MM)	MALES N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	FEMALES N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	COMBINED N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	% FEMALE
200	-	-	-	-	-	-	-	-	-	-	-	-	2	0	204	150	0	1.77	-
220	-	-	-	-	-	-	-	-	-	-	-	-	1	0	238	200	-	1.48	-
260	-	-	-	-	-	-	-	-	-	-	-	-	1	0	268	300	-	1.56	-
280	-	-	-	-	-	-	-	-	-	-	-	-	1	0	292	350	-	1.41	-
300	1	0	307	600	-	2.07	-	-	-	-	-	-	3	0	306	483	104	1.69	-
320	-	-	-	-	-	-	1	0	330	600	-	1.67	3	0	332	550	87	1.50	-
340	5	1	354	610	74	1.38	10	3	355	580	42	1.30	25	2	352	588	53	1.34	67
360	13	3	371	731	97	1.43	63	18	372	706	63	1.38	110	10	371	706	80	1.38	83
380	58	13	393	813	87	1.34	125	35	390	776	59	1.31	235	22	391	785	73	1.32	68
400	134	30	410	914	77	1.32	82	23	409	899	84	1.31	288	27	410	901	84	1.31	38
420	126	29	430	1037	83	1.31	52	15	429	991	84	1.26	224	21	429	1020	82	1.29	29
440	78	18	449	1151	94	1.28	20	6	450	1100	83	1.21	121	12	449	1134	92	1.26	20
460	21	5	466	1279	116	1.26	-	-	-	-	-	-	29	3	467	1260	128	1.24	-
480	4	1	484	1238	95	1.09	-	-	-	-	-	-	5	0	485	1200	117	1.06	-
TOTAL	440						353						1048						
MEAN			422	989	164	1.31			399	836	140	1.31			409	905	180	1.31	45

Table 4. Biological data by age group for Arctic grayling sampled from the downstream trap, Kakisa River, 1984.

AGE (YR)	MALES N	%	LENGTH(MM) MEAN	SD	WEIGHT(G) MEAN	SD	K	FEMALES N	%	LENGTH(MM) MEAN	SD	WEIGHT(G) MEAN	SD	K	COMBINED N	%	LENGTH(MM) MEAN	SD	WEIGHT(G) MEAN	SD	K	% FEMALE
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	222	23	175	35	1.61	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0	293	18	375	65	1.49	-
4	8	2	359	25	706	86	1.54	16	5	363	13	694	85	1.45	45	5	361	16	670	87	1.42	67
5	12	3	379	18	717	121	1.31	25	8	381	13	748	68	1.35	50	5	380	14	732	84	1.34	68
6	199	50	411	15	919	112	1.32	191	60	394	17	808	111	1.31	497	53	402	19	864	128	1.32	49
7	109	27	433	18	1068	118	1.32	62	19	416	19	924	141	1.28	217	23	425	21	994	152	1.29	36
8	47	12	446	18	1143	142	1.29	16	5	426	24	947	144	1.22	85	9	440	21	1084	163	1.27	25
9	18	5	449	21	1126	162	1.24	9	3	446	7	1083	94	1.22	36	4	446	19	1100	153	1.24	33
10	6	2	462	17	1258	74	1.28	2	1	439	12	975	35	1.16	10	1	456	17	1170	136	1.24	25
TOTAL	399							321							946							
MEAN			422	25	990	164	1.32			399	23	836	138	1.31			409	30	906	180	1.31	45
MEAN AGE		6.2								6.2							6.4					

Table 5. Daily number of Arctic grayling counted, tagged, and sampled (live and dead) from the upstream trap, Kakisa River, 1984.

MONTH	DAY	TOTAL	COUNT	TAGGED	LIVE	DEAD
APRIL	28	14	1	13	0	0
	29	27	9	15	3	0
	30	51	6	18	26	0
MAY	1	43	6	12	25	0
	2	57	28	16	12	1
	3	156	136	14	6	0
	4	180	164	9	6	1
	5	24	5	10	8	1
	6	211	177	11	23	0
	7	111	102	7	2	0
	8	310	287	11	11	0
	9	133	125	2	6	0
	10	226	200	4	22	0
	11	88	84	3	1	0
	12	197	190	1	6	0
	13	132	129	1	2	0
	14	102	99	2	1	0
	15	79	77	1	1	0
	16	20	19	0	1	0
	17	39	36	1	2	0
	18	12	10	0	2	0
	19	12	12	0	0	0
	20	7	6	0	1	0
	21	2	1	0	1	0
	22	5	3	0	2	0
	23	14	9	0	5	0
	24	3	0	0	3	0
	25	4	0	0	4	0
	26	5	0	0	5	0
	27	13	3	0	10	0
	28	3	0	0	3	0
	29	4	2	0	2	0
	30	5	2	0	3	0
SURVEY TOTAL		2289	1928	151	205	3

Table 6. Daily number of Arctic grayling counted, tagged, and sampled (live and dead) from the downstream trap, Kakisa River, 1984.

MONTH	DAY	TOTAL	COUNTED	TAGGED	LIVE	DEAD
APRIL	28	82	59	21	0	2
	29	152	103	23	25	0
	30	119	79	15	25	0
MAY	1	204	155	20	28	0
	2	318	269	19	24	0
	3	214	164	21	26	0
	4	284	236	18	25	0
	5	121	66	20	28	0
	6	428	366	21	37	0
	7	233	213	11	5	0
	8	129	85	15	25	0
	9	34	6	10	17	0
	10	164	119	25	19	0
	11	146	106	15	25	0
	12	132	92	15	25	0
	13	203	143	34	26	0
	14	80	61	0	19	0
	15	196	148	24	23	0
	16	152	120	5	25	0
	17	15	0	5	10	0
	18	2	0	0	2	0
	19	17	0	1	14	2
	20	13	1	3	8	1
	21	13	0	6	7	0
	22	40	21	3	15	0
	23	187	146	3	31	0
	24	191	158	0	31	0
	25	227	197	0	30	0
	26	255	229	0	23	0
	27	291	256	0	30	2
	28	256	219	0	30	0
	29	593	561	0	30	0
	30	98	98	0	0	0
SURVEY TOTAL		5589	4476	353	688	7

Appendix 1. Biological data by length interval for yellow walleye sampled from the fish weir, Kakisa River, 1984.

LENGTH INTERVAL (MM)	MALES N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	FEMALES N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	COMBINED N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	% FEMALE
360	1	3	374	500	-	0.96	-	-	-	-	-	-	2	2	368	500	0	1.01	-
380	-	-	-	-	-	-	-	-	-	-	-	-	3	3	393	717	58	1.18	-
400	5	14	404	770	45	1.17	-	-	-	-	-	-	8	9	407	800	60	1.19	-
420	8	23	432	944	166	1.17	1	20	435	1100	-	1.34	14	16	433	993	137	1.22	11
440	6	17	446	1067	82	1.20	2	40	443	1125	106	1.29	12	14	446	1071	94	1.21	25
460	6	17	471	1217	61	1.17	-	-	-	-	-	-	14	16	471	1332	122	1.28	-
480	3	9	486	1450	265	1.26	1	20	492	1650	-	1.39	14	16	488	1421	185	1.22	25
500	-	-	-	-	-	-	1	20	508	1750	-	1.33	7	8	509	1621	152	1.23	-
520	2	6	530	1825	35	1.23	-	-	-	-	-	-	8	9	526	1725	219	1.18	-
540	2	6	549	1875	35	1.13	-	-	-	-	-	-	2	2	549	1875	35	1.13	-
560	1	3	563	1750	-	0.98	-	-	-	-	-	-	1	1	563	1750	-	0.98	-
580	1	3	584	2450	-	1.23	-	-	-	-	-	-	1	1	584	2450	-	1.23	-
TOTAL	35						5						86						
MEAN			460	1187	426	1.17			464	1350	326	1.33			465	1255	378	1.21	13

Appendix 2. Biological data by length interval for northern pike sampled from the fish weir, Kakisa River, 1984.

LENGTH INTERVAL (MM)	MALES N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	FEMALES N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	COMBINED N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	% FEMALE
350	1	1	391	300	-	0.50	-	-	-	-	-	-	8	2	376	431	92	0.83	-
400	7	9	429	650	227	0.81	1	1	434	650	-	0.80	34	7	428	653	181	0.83	13
450	22	29	474	766	123	0.72	5	7	475	930	489	0.86	79	17	476	792	181	0.73	19
500	12	16	530	1171	247	0.78	9	13	527	1061	162	0.72	77	17	527	1058	191	0.72	43
550	19	25	575	1318	192	0.69	14	20	573	1468	305	0.78	88	19	574	1318	233	0.70	42
600	10	13	627	1865	204	0.75	16	23	619	1794	299	0.75	82	18	623	1736	281	0.72	62
650	2	3	673	2200	212	0.72	9	13	658	2161	313	0.76	37	8	666	2024	396	0.69	82
700	1	1	706	2000	-	0.57	2	3	728	3600	990	0.94	8	2	718	2675	723	0.72	67
750	1	1	780	3650	-	0.77	9	13	775	3433	545	0.74	19	4	770	3266	577	0.71	90
800	1	1	827	4000	-	0.71	-	-	-	-	-	-	9	2	816	3861	410	0.71	-
850	-	-	-	-	-	-	3	4	881	4450	507	0.65	4	1	879	4700	649	0.69	-
900	-	-	-	-	-	-	2	3	925	6125	106	0.78	5	1	919	6000	267	0.77	-
950	-	-	-	-	-	-	-	-	-	-	-	-	2	0	958	6550	141	0.75	-
1000	-	-	-	-	-	-	1	1	1002	7300	-	0.73	2	0	1006	8725	2015	0.86	-
TOTAL	76						71						454						
MEAN			540	1230	638	0.73			638	2177	1364	0.76			576	1543	1115	0.73	48

Appendix 3. Biological data by length interval for longnose sucker sampled from the fish weir, Kakisa River, 1984.

LENGTH INTERVAL (MM)	MALES N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	FEMALES N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	COMBINED N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	% FEMALE
320	-	-	-	-	-	-	-	-	-	-	-	-	1	0	323	400	-	1.19	-
380	-	-	-	-	-	-	-	-	-	-	-	-	4	1	389	950	303	1.64	-
400	2	6	417	975	35	1.35	1	4	415	900	-	1.26	33	5	412	1052	212	1.51	33
420	9	29	432	1059	88	1.32	1	4	421	1000	-	1.34	65	10	431	1117	142	1.40	10
440	6	19	450	1200	126	1.32	6	23	453	1383	258	1.49	115	18	450	1272	231	1.39	50
460	4	13	474	1350	71	1.27	4	15	468	1400	58	1.37	130	21	469	1379	168	1.33	50
480	5	16	483	1530	182	1.36	4	15	493	1763	75	1.47	108	17	488	1569	278	1.35	44
500	4	13	508	1850	521	1.41	1	4	501	1750	-	1.39	77	12	510	1692	241	1.27	20
520	1	3	520	1900	-	1.35	4	15	533	1950	548	1.29	55	9	528	1842	342	1.25	80
540	-	-	-	-	-	-	2	8	545	2400	354	1.48	27	4	549	2215	324	1.34	-
560	-	-	-	-	-	-	3	12	566	2033	247	1.12	11	2	568	2227	383	1.21	-
580	-	-	-	-	-	-	-	-	-	-	-	-	3	0	593	2367	861	1.13	-
600	-	-	-	-	-	-	-	-	-	-	-	-	2	0	612	2800	354	1.23	-
TOTAL	31						26						631						
MEAN			461	1324	353	1.33			493	1665	454	1.38			478	1482	396	1.35	46

Appendix 4. Biological data by length interval for white sucker sampled from the fish weir, Kakisa River, 1984.

LENGTH INTERVAL (MM)	MALES N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	FEMALES N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	COMBINED N	%	LENGTH(MM) MEAN	WEIGHT(G) MEAN	SD	K	% FEMALE
360	-	-	-	-	-	-	-	-	-	-	-	-	2	1	379	825	106	1.52	-
380	2	6	391	925	35	1.55	-	-	-	-	-	-	6	2	391	983	98	1.65	-
400	4	12	410	1063	63	1.54	-	-	-	-	-	-	19	5	409	1113	282	1.63	-
420	7	21	429	1343	331	1.71	-	-	-	-	-	-	29	8	431	1416	406	1.77	-
440	4	12	450	1525	87	1.68	2	9	452	2500	1626	2.70	42	12	450	1536	391	1.68	33
460	11	32	469	1705	135	1.65	2	9	478	1900	0	1.74	61	17	470	1648	209	1.59	15
480	5	15	485	1950	127	1.71	3	14	493	1900	328	1.59	49	14	491	1930	327	1.63	38
500	-	-	-	-	-	-	7	32	510	2293	420	1.73	60	17	510	2180	333	1.65	-
520	1	3	524	2450	-	1.70	4	18	525	2600	268	1.80	55	16	528	2455	485	1.67	80
540	-	-	-	-	-	-	4	18	552	2938	269	1.75	28	8	547	2650	377	1.62	-
560	-	-	-	-	-	-	-	-	-	-	-	-	3	1	566	2967	437	1.63	-
TOTAL	34						22						354						
MEAN			451	1546	383	1.65			510	2395	578	1.82			485	1916	582	1.65	39

Appendix 5. Biological data by length interval for lake whitefish sampled from the fish weir, Kakisa River, 1984.

LENGTH INTERVAL (MM)	NO.	PERCENT	MEAN FORK LENGTH(MM)	ROUND WEIGHT(G) MEAN	ROUND WEIGHT(G) SD	K
340	1	1	344	500	-	1.23
360	5	6	372	690	178	1.33
380	7	8	390	836	56	1.41
400	30	34	411	1022	88	1.48
420	24	27	430	1173	119	1.47
440	14	16	447	1289	81	1.44
460	4	5	466	1500	147	1.48
480	2	2	487	1375	177	1.19
500	1	1	509	1700	-	1.29
TOTAL	88					
MEAN			423	1103	228	1.45

Appendix 6. Biological data by length interval for round whitefish sampled from the fish weir, Kakisa River, 1984.

LENGTH INTERVAL (MM)	NO.	PERCENT	MEAN FORK LENGTH(MM)	ROUND WEIGHT(G) MEAN	ROUND WEIGHT(G) SD	K
320	2	11	337	1000	707	2.61
340	8	44	351	531	53	1.23
360	6	33	368	575	52	1.16
380	2	11	389	675	106	1.15
TOTAL	18					
MEAN			359	614	232	1.35

Appendix 7. Biological data by length interval for mountain whitefish sampled from the fish weir, Kakisa River, 1984.

LENGTH INTERVAL (MM)	NO.	PERCENT	MEAN FORK LENGTH(MM)	ROUND WEIGHT(G) MEAN	ROUND WEIGHT(G) SD	K
320	2	11	325	425	35	1.24
340	6	33	353	525	42	1.19
360	3	17	367	567	29	1.15
380	1	6	398	850	-	1.35
400	2	11	406	1000	0	1.49
420	1	6	422	1070	-	1.42
440	1	6	450	1050	-	1.15
480	2	11	486	1650	71	1.44
TOTAL	18					
MEAN			385	776	389	1.27

Appendix 8. Biological data by length interval for burbot sampled from the fish weir, Kakisa River, 1984.

LENGTH INTERVAL (MM)	NO.	PERCENT	MEAN FORK LENGTH(MM)	ROUND WEIGHT(G) MEAN	ROUND WEIGHT(G) SD	K
360	2	20	370	475	106	0.93
380	1	10	398	500	-	0.79
400	2	20	410	925	601	1.37
420	2	20	424	550	71	0.72
440	2	20	451	600	141	0.65
540	1	10	546	950	-	0.58
TOTAL	10					
MEAN			425	655	288	0.87

Appendix 9. Daily number of species (excluding Arctic grayling) counted and sampled from the fish weir, Kakisa River, 1984.

1984		LONGNOSE SUCKER	NORTHERN PIKE	YELLOW WALLEYE	LAKE WHITEFISH	ROUND WHITEFISH	MOUNTAIN WHITEFISH	BURBOT
MONTH	DAY							
APRIL	28	58	13	0	0	0	0	0
	29	282	32	1	1	0	0	1
	30	386	44	0	1	0	0	0
MAY	1	540	30	0	2	0	0	1
	2	783	32	0	2	0	1	0
	3	1391	23	0	2	1	1	0
	4	2277	22	0	0	0	0	2
	5	928	35	0	0	0	0	0
	6	2275	25	2	1	1	0	1
	7	4331	13	2	2	2	0	0
	8	4499	40	2	2	0	0	1
	9	2019	7	7	1	0	0	0
	10	3811	7	14	13	4	0	1
	11	1693	12	1	7	0	0	0
	12	5782	16	2	9	1	0	0
	13	12123	9	6	0	2	0	0
	14	6509	12	8	22	0	0	0
	15	6192	28	23	5	0	0	2
	16	4359	15	17	3	1	0	1
	17	2527	22	5	5	0	0	0
	18	1092	24	18	3	0	0	1
	19	380	25	22	3	0	5	0
	20	109	13	9	5	0	0	0
	21	141	15	9	4	0	1	0
	22	91	8	4	1	0	0	0
	23	120	14	5	3	1	2	0
	24	154	11	1	3	0	0	0
	25	229	15	3	8	0	2	0
	26	137	13	3	7	0	1	0
	27	128	13	1	14	1	2	0
	28	158	19	0	3	0	5	0
	29	699	13	2	2	2	5	0
	30	234	14	1	1	0	1	0
	31	0	10	0	0	0	0	0
JUNE	1	0	7	1	0	0	0	0
SURVEY TOTAL		66437	651	169	135	16	26	12